FIRE ISLAND NATIONAL SEASHORE
5TH BIENNIAL SCIENCE AND CULTURAL RESOURCE CONFERENCE

ABSTRACTS FOR THE INVENTORY AND MONITORING SESSION, WEDNESDAY, APRIL 6, 2005, 9:00 AM – 12:30 PM

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SELECTION OF "VITAL SIGNS" TO MONITOR ECOSYSTEM INTEGRITY FOR NORTHEAST COASTAL NATIONAL PARKS (USA)

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Fire Island National Seashore is one of the eight National Park units that comprise the Northeast Coastal and Barrier Network. The Network Parks play an important role in the conservation of critical coastal habitat for many rare and endangered species, as well as migratory corridors for birds, sea turtles and marine mammals. They also protect vital coastal wetlands, essential to water quality, fisheries, and the biological diversity of coastal, nearshore, and terrestrial environments. The Network is collaborating with park managers and subject matter experts to develop an issue based "Vital Signs" monitoring program to assess the ecological integrity of these parks. Through a series of scoping sessions and workshops the Network developed and prioritized a list of candidate vital signs and is now developing protocols to monitor shoreline change, estuarine nutrient enrichment, salt marsh vegetation and nekton, landscape change, and park use. Given the high degree of similarity in ecosystem types, processes, and threats among the parks, the Network has chosen to develop a regional approach to Vital Signs Monitoring. The intent is to choose protocols that will be relevant to the collective needs of all parks. Once monitoring begins the network will be able to assess changing conditions within specific parks and to place these changes in a regional context by comparing trends and values with other parks.

INVENTORY OF VERTEBRATES AND VASCULAR PLANTS IN NORTHEAST COASTAL NATIONAL PARKS (USA)

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As large tracts of public lands, such as national parks, become more insular from increased fragmentation due to agricultural development, urbanization, or other land use changes, these lands become increasingly valuable for the long-term maintenance of flora

and fauna. Since the establishment of the National Park Service (NPS), natural resource data have been collected by a variety of sources; university scientists, scientists within the parks, and organized groups such as state breeding bird atlases, state herpetological atlases and other similar watch groups. Although this biological information exists for many of the parks, much of it has never been compiled and reviewed by the Service. Over the past decade, the National Park Service has been working to establish what is now called the Inventory and Monitoring Program (I&M program). The principal and simplified functions of this program are to gather existing as well as new information about the natural resources in the parks and to make that information easily available at different levels to park resource managers, the scientific community, and the public. Fire Island National Seashore is one of the eight National Park units that comprise the NPS Northeast Coastal and Barrier Network. Through the I&M Program, baseline vertebrate and vascular plant inventories, as well as inventories on other taxonomic groups of special interest or concern, are being conducted. These inventories will provide reliable species information for the parks, a fundamental tool for the management of biodiversity.

MONITORING SALT MARSH PROCESSES AND FUNCTIONS – INITIATION OF A LONG-TERM PROGRAM

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Salt marshes provide habitat for a variety of species including recreational and commercial fishes, forage species, and migratory shorebirds and waterbirds. Over the past century the nation's salt marshes, including those of Long Island's south shore, have been altered in response to dredging, filling, ditching, nutrient enrichment, and other activities. In addition to these human-induced factors, marshes of back-barrier lagoon systems are susceptible to change associated with inlet and overwash processes. Salt marshes, because of their location at the interface of terrestrial and estuarine aquatic habitats and because of documented responses to human-induced threats and natural processes, represent ideal environments for long-term ecosystem monitoring. The NPS, at coastal parks from Maine to Virginia, is now testing sampling procedures to monitor salt marsh vegetation and nekton (fishes and decapod crustaceans). As physical and chemical factors change in the estuary (e.g., sea level, nutrients, salinity) the species composition and patterns of vegetation and nekton communities will change. Marsh development processes are also being monitored using SET (Surface Elevation Table) technology. The marsh surface must keep pace with sea level rise, but with predicted accelerated rates of sea level in response to global warming there is concern that sea level will rise at a rate greater than marsh elevation increases, resulting in submergence of marsh habitat. Salt marsh monitoring has been ongoing at several locations along the Fire Island barrier since 2002 (Watch Hill, Hospital Point, Great Gun Meadows),

representing a gradient of conditions related to proximity to inlets. Initial findings are reported.

MONITORING ESTUARINE CONDITION IN NORTH ATLANTIC COASTAL PARKS

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Along the U.S. Atlantic coast from Maine to Virginia, there are nine National Park units with significant estuarine resources, including Fire Island National Seashore. Nutrient over-enrichment has been identified by resource managers as one of the highest priority threats to estuarine integrity in these parks. Protecting estuaries from nutrient enrichment requires understanding the relationships among nutrient sources, nutrient loads, and ecosystem response, and detecting threats to estuarine status so that management solutions can be implemented. The USGS has assisted with developing appropriate, feasible, and cost effective protocols for monitoring estuaries within North Atlantic coastal parks through the NPS Vital Signs Monitoring Program. Vital Signs monitoring is focused on assessing condition and detecting change using indicators of nutrient load (e.g. land use, point-source discharges) and estuarine response (dissolved oxygen, chlorophyll, light attenuation, sediment organic carbon, seagrass distribution, seagrass condition). When the program is fully implemented, estuarine response variables will be monitored annually at each park during a mid- to late-summer index period. In 2003, we conducted pilot sampling of water quality variables at Fire Island National Seashore in a feasibility test of the proposed monitoring protocol. Continuous and discrete measurements provided a snapshot of estuarine condition within the park boundary and guided development of a uniform monitoring protocol for the entire North Atlantic coastal parks region.

I&M NETWORK BASED GEOMORPHOLOGIC MONITORING AT FIRE ISLAND NATIONAL SEASHORE

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Fire Island National Seashore (FIIS) is one of eight parks that make up the National Park Service Northeast Coastal and Barrier Network (NPS NCBN). The Network parks contain both ocean and estuarine features each of which requires its own approach to monitoring. Responding to priorities identified by park resource managers and coastal scientists, ocean beach and dune features have been assigned first priority for development.

The morphology of ocean beach and dune systems is controlled by a complex interaction of sea level, sediment supply, and wave climate. As such, the beach/dune feature includes a number of both terrestrial and marine components. Simultaneous development of a monitoring program to include all of these is beyond the resources of

the Network program. However, there are several morphologic features that can be monitored at the Network level and provide park management with useful information. Using feasibility and data value as weighting factors, the Network selected ocean shoreline position and beach dune topography as Vital Signs for monitoring.

Currently, protocols are being developed and tested for each of these features. Ocean shoreline position will be collected via GPS surveys along the entire ocean beach on a semi-annual basis that corresponds to seasonal extremes in beach morphology. Because the protocol will utilize a visual cue (the neap high tide swash line), familiarity with the appearance of the beach is critical to successful execution of the ocean shoreline survey. To meet this need the Network is recommending the use of local park staff and/or cooperators to accomplish the shoreline survey. Network resources will assist with training local staff, equipment acquisition, data management and analysis, and offset of costs to parks for use of their staff for field activity. Testing of the ocean beach protocol is scheduled for the spring of 2005 with training and implementation commencing in the fall of 2005.

The second Vital Sign in the Network's geomorphologic monitoring program is general beach dune topography. This protocol is scheduled for development in 2005 and as currently envisioned, will consist of an in-situ data collection and a remote sensing segment. The field data collection will consist of an annual elevation survey along shore perpendicular transects using an optical or satellite based (GPS) total station. Sample locations and spacing will be determined on an individual park basis and in consultation with park staff and scientific cooperators. Remote sensing will consist of biennial LIDAR surveys of the entire beach-dune system. Currently, LIDAR surveys and morphologic feature extraction such as dune crest and toe, edge of vegetation, and beach width are being developed as part of a cooperative research effort with NASA, USGS, and Rutgers University. A secondary goal of the multi-agency research is the development of a multi-sensor airborne platform that can collect a number of simultaneous park-wide measurements to address a variety of resource information needs. These include LIDAR, a digital imaging system, and multi and hyper spectral sensor instruments. The Network is also working with park and university cooperators to develop a GIS based set of tools for basic analysis and reporting of the geomorphologic monitoring data.

REMOTE SENSING OF TERRESTRIAL AND SUBMERGED AQUATIC VEGETATION IN FIRE ISLAND NATIONAL SEASHORE: TOWARDS LONG-TERM RESOURCE MANAGEMENT AND MONITORING

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The objectives of this project are to map the terrestrial vegetation and seagrass habitats within the Fire Island National Seashore boundary using high spatial resolution QuickBird-2 multispectral satellite remote sensing data and to examine the capability of

hyperspectral remote sensing data in submerged aquatic vegetation mapping. The sensors on board QuickBird-2 satellite provided data with 0.61-meter spatial resolution for the panchromatic band and 2.5-meter spatial resolution for the multispectral bands ranging from visible to near infrared spectrums. The Hyperion sensor on board the EO-1 satellite provided hyperspectral data with 220 spectral bands ranging from 0.4 to 2.5 μm with a 30-meter resolution. The increased spectral and spatial resolutions of these sensors allows for better spectral signatures that can result in improved mapping efficiency. To assist information extraction and accuracy assessment, we created a virtual field reference database (VFRDB) that contains spatially referenced multi media data. Currently, the VFRDB includes over 5800 meters of towed underwater video transects within the Great South Bay and over 1000 field georeferenced digital photographs both in the Fire Island and the Bay. The ground truthing data allowed us to compare and validate the agreement between satellite derived vegetation maps and the delineation result from a previous NPS vegetation mapping project, as well as the vegetation information extracted from QuickBird-2 and Hyperion satellites. The comparisons of vegetation information derived from different data sources allow us to objectively determine the protocols for monitoring of vegetation change in a reasonable time frame and cost in the dynamic coastal environment of Fire Island.